

COOLING OF MINIATURE X-RAY TUBEAbstract of the Disclosure

A miniature x-ray tube is cooled using a catheter preferably having multiple small lumens for inflow and outflow of coolant. Inflow may be through an outer lumen(s) in a concentric-extrusion catheter, the liquid turning back at the distal end of the catheter to a proximal flow over the anode end of the x-ray tube and through an inner lumen within which the x-ray tube is positioned. A coolant distribution head may engage with the anode end of the x-ray tube, with small orifices so as to distribute coolant essentially evenly over the anode surface. Temperature and flow rate of the inflowing coolant liquid are balanced so as to optimize heat transfer while efficiently carrying coolant through small lumens without the need for high pressures. Some embodiments use the inflation liquid in an applicator balloon as the coolant, with the liquid actively flowing or, in a simplified system, with the liquid static.